SHORT RESUME/ SYNOPSIS OF Ph.D. TOPIC

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EFFECT OF INSECTICIDES ON PHYSIOLOGY OF FRESHWATER FISH, *CATLA CATLA* FROM YELDARI DAM, DIST PARBHANI, M.S.

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SHORT RESUME/ SYNOPSIS OF PH. D TOPIC

EFFECT OF INSECTICIDES ON PHYSIOLOGY OF FRESHWATER FISH, *CATLA CATLA* FROM YELDARI DAM, DIST PARBHANI, M.S.

ABSTRACT OF PROPOSED WORK PLAN/ PROBLEM

1. Introduction:

Freshwater ecosystems are vital for supporting a wide variety of organisms, including fish species that are both economically and ecologically important. Among these, *Catlacatla*, commonly known as catla, holds a significant place. This fish is one of the major carp species extensively cultivated in Indian aquaculture due to its high demand. It is not only a valuable source of protein for human consumption but also plays a key role in the livelihoods of local communities by providing income through fishing and aquaculture activities.

However, the health of freshwater ecosystems and the survival of species like *Catlacatla* are increasingly being threatened by human activities. One major concern is agricultural runoff, which often contains chemical insecticides. These insecticides, widely used to protect crops, can end up in nearby water bodies, especially during rainfall or irrigation. When these chemicals enter aquatic ecosystems, they disrupt the delicate balance of life in these environments. Fish species like *Catlacatla* are particularly vulnerable to such pollution, as the chemicals can harm their physiology, alter their natural behavior, and even reduce their chances of survival.

In the Yeldari Dam region of Parbhani, Maharashtra, agricultural activities are widespread. Farmers in this area rely heavily on chemical insecticides to maintain crop productivity. Unfortunately, the use of these chemicals comes with unintended consequences for the dam's aquatic ecosystem. When insecticides are washed into the dam’s waters, they pose a serious threat to the biodiversity within, including *Catlacatla*. These fish may experience damage to vital organs, changes in behavior, and increased mortality rates due to the toxic effects of these chemicals.

Such impacts raise significant ecological concerns, as they not only endanger fish populations but also affect the broader ecosystem and the communities that depend on it. Understanding how insecticides harm aquatic organisms like *Catlacatla* is essential for finding solutions. Protecting freshwater ecosystems, especially those as important as Yeldari Dam, requires focused research, awareness, and sustainable agricultural practices to minimize chemical runoff and safeguard aquatic life for future generations.

2. Review of Literature and Development in the

Long-term exposure of fish to pesticides, including insecticides, poses ongoing health risks to aquatic life and, indirectly, to humans who consume these contaminated fish. This situation is a significant public health concern, as toxic substances can accumulate in the tissues of fish, which are an important source of food for many communities. The consumption of such polluted fish could lead to serious health problems for humans.

To address this issue, the responsible and controlled use of pesticides is crucial. Proper pesticide management is one of the most effective ways to reduce environmental pollution in aquatic ecosystems. Rationalizing the use of pesticides involves selecting the right type of pesticide, applying it in appropriate amounts, and minimizing its impact on non-target organisms and the environment. By doing so, the harmful effects on marine organisms and the broader ecosystem can be mitigated.

Precautions during pesticide application are essential to protect both wildlife and water quality. Using modern, well-designed equipment that minimizes environmental contamination can significantly reduce pollution. Additionally, combining pesticides with other pest control measures, such as biological or cultural controls, can help limit the excessive reliance on chemical pesticides. Such integrated pest management practices can prevent contamination of surface waters and safeguard aquatic life.

The use of advanced scientific approaches, like molecular biology techniques, offers promising solutions for tackling pesticide-related challenges. These methods are more cost-effective, less time-consuming, and do not require testing on animals. They have the potential to revolutionize the way we monitor and address environmental stressors caused by pesticides.

It is also critical to regularly monitor pesticide levels in water bodies to ensure public safety. Ongoing surveillance helps identify contamination trends and evaluate the effectiveness of pollution control measures. Furthermore, more experimental research is necessary to determine safe pesticide concentrations and exposure durations that do not cause harmful effects on fish, including sublethal effects that may impact their health and behavior over time.

In summary, ensuring the safe use of pesticides requires a multi-pronged approach, including responsible application, regular monitoring, and continued research. By taking these steps, we can reduce the risks posed by pesticides to aquatic ecosystems, wildlife, and human populations while maintaining the ecological balance necessary for sustainable development.

3. Objectives of Research:-

1. To assess the toxic effects of insecticides on the physiology, behavior, and survival of *Catlacatla*.
2. To analyze the concentration and duration of exposure that cause harmful effects on the fish.
3. To study the impact of insecticides on water quality and the aquatic ecosystem where *Catlacatla* resides.
4. To evaluate the potential risks to human health through the consumption of fish contaminated with insecticides.
5. To identify sustainable solutions for reducing insecticide pollution in aquatic environments.
6. To recommend safe pesticide application practices that minimize harm to fish and other aquatic organisms.
7. To explore alternative pest control methods to reduce dependency on harmful chemical insecticides.
8. Improve the fresh water fishe quality

Key Words

CatlaCatla ; Freshwater fish ; Insecticides ; Fish Physiology ; Behavioral Changes ;

Fish Health Risks ; Human Health Risks ;

Hypothesis of Study:

The hypothesis of this study is that insecticides, commonly used in agricultural practices, have a harmful impact on the health and survival of freshwater fish Catlacatla. When insecticides are washed into water bodies through agricultural runoff, they contaminate the aquatic environment. This study suggests that exposure to insecticides will cause various harmful effects on Catlacatla, including damage to their internal organs, changes in behavior, and increased mortality rates. Additionally, the presence of insecticides in the water could disrupt the overall balance of the aquatic ecosystem, affecting not just the fish but also other organisms living in the water. Furthermore, consuming Catlacatla that has been exposed to insecticides may pose risks to human health. The study aims to investigate the extent of these harmful effects, the concentration of insecticides that cause damage, and the potential long-term impacts on both the aquatic environment and human populations.

Methodology to be adopted:

To study the effects of insecticides on freshwater fish Catlacatla, the following methodology will be used:

1. Selection of Study Area:

The research will focus on freshwater bodies, such as the Yeldari Dam or similar aquatic environments, where insecticides from nearby agricultural fields can enter the water.

2. Collection of Fish Samples:

Healthy Catlacatla fish will be collected from these freshwater sources. The fish will be selected based on size and age to ensure consistency across the study.

3. Insecticide Selection and Preparation

Commonly used insecticides in the region, such as organophosphates or carbamates, will be selected for the study. The insecticides will be prepared in different concentrations, simulating the levels that might be found in water bodies after runoff from agricultural areas.

4. Experimental Setup:

The fish will be divided into different groups:

5.Control group:Fish that are kept in water with no insecticide exposur

Test groups: Fish exposed to different concentrations of insecticides

The exposure will last for varying durations, such as 24, 48, and 72 hours, to observe both short-term and long-term effects.

a) Methods of research

The research on the effects of insecticides on freshwater fish Catlacatla will follow a systematic approach to understand the impact of insecticides on fish health, behavior, and survival. The methods will include the following steps:

1. Selection of Research Site:

The research will focus on freshwater ecosystems, such as rivers, lakes, or dams, where agricultural runoff is a common source of insecticide pollution. The Yeldari Dam in Parbhani, Maharashtra, will be one of the study sites due to its proximity to agricultural areas that use insecticides.

2. Collection of Fish Samples:

Healthy Catlacatla fish will be collected from the study area. Fish of similar size and age will be selected to ensure consistency in the experiment. Fish will be transported to a controlled laboratory environment to avoid external environmental factors.

3. Preparation of Insecticide Solutions:

Common insecticides used in local agricultural practices, such as organophosphates or pyrethroids, will be selected for the experiment. Different concentrations of these insecticides will be prepared, based on the typical levels found in freshwater bodies due to runoff. These concentrations will be tested in the experiment

b) Sampling design

Selection of study area

The research will take place in freshwater bodies like dams or rivers, such as the yeldari dam in Parbhani, maharashtra, where agricultural runoff may carry insecticides into the water

c) Research design

The research design to study the effects of insecticides on Catlacatla will follow these steps:

1. Objective:

The main objective is to assess how insecticides affect the health, behavior, and survival of Catlacatla in freshwater environments.

2. Study Area:

The research will be conducted in freshwater bodies such as the Yeldari Dam, Maharashtra, where agricultural runoff may introduce insecticides into the water.

3. Experimental Groups:

Fish will be divided into:

- Control Group: Fish that are not exposed to insecticides.

- Test Groups:Fish exposed to different levels of insecticides (low, medium, high).

4. Exposure:

Fish will be exposed to insecticides for specific periods, such as 24, 48, and 72 hours. Each group will be exposed to different concentrations of insecticides.

5. Monitoring:

During the exposure, the water will be tested for insecticide levels, and fish will be observed for any changes in behavior, swimming, or physical condition.

6. Post-Exposure Analysis:

After exposure, fish will be euthanized, and their organs will be examined for damage. Any fish that die will be examined to determine if insecticides caused their death.

d) Methods of data collection

Journals ,internate information, field visit

Data will be collected on fish behavior, health, survival rate, and water quality throughout the experiment.

e) Methods of data Analysis:

1 Descriptive Statistics:

Basic statistics like mean, median, and standard deviation will be used to summarize the data on fish health, behavior, and survival rates in different groups.

. 1 Comparing Groups:

The control group (no insecticide) and test groups (with insecticide exposure) will be compared to identify any significant differences in fish behavior, health, and survival.

2 Behavior Analysis:

Changes in fish behavior (such as swimming patterns or feeding habits) will be recorded and analyzed for any patterns that could be linked to insecticide exposure

Study Area:-

4. Importance of Study:

This study is important for several reasons:

1. Protecting Fish Health:
   It helps understand how insecticides affect the health, behavior, and survival of Catlacatla, an important fish species in aquaculture.

2. Environmental Protection:
   By studying the effects of insecticides on freshwater ecosystems, the research can highlight the risks posed to aquatic life and the environment.

3. Human Health Risk:
   The study will assess how consuming fish exposed to insecticides may affect human health, especially for communities relying on fish as a food source.

4. Better Practices:
   The findings can lead to better agricultural practices, reducing the harmful impact of insecticides on aquatic organisms.

5. Sustainability:
   It supports the development of safer pest control methods, ensuring the long-term health of both aquatic life and human populations.

- **International Status-**

  The impact of insecticides on freshwater fish, including Catlacatla, is a global concern. Many countries, especially those with large agricultural sectors, face issues related to pesticide runoff into water bodies. Research in places like the United States, Europe, and Southeast Asia has shown that insecticides can harm aquatic ecosystems, affecting fish health and biodiversity.

- In countries like India, where Catlacatla is widely farmed, the use of insecticides in agriculture poses significant risks to both aquaculture and the environment. International studies emphasize the need for safer pesticide use, better regulations, and sustainable practices to protect aquatic life. This research is essential to guide global efforts in reducing pesticide pollution in freshwater systems.

- **National Status-**

  In India, the use of insecticides in agriculture is widespread, especially in regions with intensive farming. This leads to pesticide runoff into water bodies, impacting aquatic life, including Catlacatla. Studies have shown that insecticides can harm fish health and disrupt ecosystems in Indian rivers, lakes, and dams.

  With Catlacatla being an important species for aquaculture and local food security, the effects of insecticides are a significant concern. The Indian government and environmental agencies are working to improve pesticide regulations and promote

sustainable farming practices to protect freshwater ecosystems. Research on the impact of insecticides on fish like Catlacatla is crucial for developing better management strategies.

•Significance of the study-

This study is important because:

1. **Protects Fish:** It helps understand how insecticides affect the health of *Catlacatla* and other fish in freshwater ecosystems.
2. **Food Safety:** It ensures that fish exposed to insecticides are safe for human consumption.
3. **Improves Farming Practices:** The study can guide farmers to use safer pesticides and reduce environmental harm.
4. **Supports Conservation:** It helps protect aquatic life and maintain biodiversity in freshwater habitats.

- **Proposed work Plan/ Formulation and Structure of Study:**

1. **Study Design:**
    - **Site Selection:** Choose freshwater bodies like rivers or dams for sample collection.
    - **Fish Selection:** Collect healthy *Catlacatla* fish of similar size and age.
2. **Experiment Setup:**
    - Divide fish into control and test groups with different insecticide concentrations (low, medium, high).
    - Expose fish to insecticides for set periods (e.g., 24, 48, 72 hours).
3. **Data Collection:**
    - Monitor fish behavior, health, and survival rates.
    - Measure water quality (pH, oxygen levels) and insecticide concentration.
4. **Post-Exposure Analysis:**
    - Examine fish for internal damage.
    - Record mortality rates and any behavioral changes.
5. **Data Analysis:**
    - Compare results between control and test groups using statistical methods.
    - Evaluate the impact of insecticides on fish health and the environment.
6. **Conclusion and Recommendations:**
    - Provide suggestions for safer pesticide use to protect aquatic life.

Year- Wise Plan of Work and Targets to be Achieved:-

FIRST YEAR:

Preparation:

- Select study sites and gather necessary materials.
- Obtain Catlacatla fish samples for the study.
- Set up experimental tanks and conditions for testing.
- Target: Complete initial setup and begin the preliminary experiment

SECOND YEAR:

Experimentation:

- Expose fish to different concentrations of insecticides.
- Monitor water quality and fish health regularly.
- Target: Collect data on fish behavior, survival, and water quality after exposure.

THIRD YEAR:

- Analysis:

Analyze the data collected, including fish health, mortality, and water quality.

- Identify patterns and effects of insecticides on fish.
- Target: Complete data analysis and draw conclusions.

Writing of thesis, submission of thesis

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